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How do interventions in primary care or in emergency departments impact less urgent patients' emergency care utilization? A systematic review

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Abstract

Background Health care policy in Germany focuses on restructuring ambulatory emergency care services to serve patients more efficiently. Up to 60% of patients self-refer to emergency departments (EDs), although a relevant share could be treated in primary care. This systematic review aims to determine how interventions in primary care or in emergency departments impact emergency care utilization, especially by less urgent patients self-referring to EDs.

Methods This systematic review was registered in PROSPERO in 2023. MEDLINE, the Cochrane Library, and Epistemonikos were last searched in April 2025. Reference- and cited-by-searches were conducted. RCTs or non-randomized studies with an intervention and a comparison group were included. Titles and abstracts were screened, and the quality of full texts was assessed by 2 independent reviewers. Quality assessment was conducted with the Cochrane Risk-of-Bias Tool for RCTs and with the ROBINS-I criteria for non-randomized studies. Data on study characteristics and results were extracted by one reviewer and checked by a second reviewer. The outcome of primary interest was the utilization of EDs or primary care services.

Results Data was extracted for the following interventions: changes in the accessibility/availability of primary care physicians; new/alternative primary care services for emergency care; patient education about available emergency services; addition of primary care services to EDs; introduction of common access points for emergency ED/primary care at hospitals; and co-payments for ED attendance. Studies suggest that increasing the accessibility/availability of primary care services outside of the ED reduces ED utilization, especially by less urgent patients. The addition of primary care services to EDs may induce additional demand. The quality of the best available non-randomized evidence was low.

Conclusions Primary care services outside the hospital, especially out-of-hours, may keep especially low-acuity patients away from EDs. The addition of primary care services to EDs in hospitals may increase demand in hospital/ED care. Owing to the low certainty of the evidence, these findings should be interpreted with caution. Future high-quality studies should track patient pathways to monitor the origins of avoidable self-referrals to EDs as well

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as the quality of care these patients receive. New care models such as virtual patient consultations could be further investigated.

Trial Registration in PROSPERO CRD42023493308

Keywords Emergency department, Emergency room, Emergency service, Acute care services, Low-urgency patients, Self-refer, Self-referrals

Background

Health care policy in Germany has recently focused on restructuring ambulatory emergency care services to better and more efficiently serve patients with urgent care needs. International studies suggest that up to 60% of patients who self-refer to emergency departments (EDs) could in fact be equally well managed in a primary care setting, e.g., by a general practitioner during or outside office hours, by out-of-hours primary care clinics, or by primary care centers associated with hospitals [1–4].

As in many other countries, emergency care in Germany is currently under construction. The 3 pillars of emergency care, ambulance services, EDs and primary care – especially for less urgent patients -, often do not work as smoothly and are not as well coordinated as they could be. An increased perception of lack of primary care physicians and specialist care, particularly in rural areas, and overuse of EDs by less urgent or non-urgent patients are major challenges in this context. Therefore, current health care reform aims to introduce so-called "integrated emergency centers" at, or next to hospitals, where all incoming patients are triaged to primary care or emergency care on the basis of initial presentation [5]. Additionally, a national phone number can be utilized to coordinate out-of-hours and emergency care. However, it remains unclear which measures might be most appropriate to keep especially low-urgency self-referrals out of the EDs and still get them to the most appropriate care in a specific emergency care situation.

Several qualitative studies and reviews of such studies suggest that patients most often use EDs for the following reasons: perceived urgency of their own or a child's health problem, easy access and 24-hour availability of a broad spectrum of ED services—including the availability of X-rays and other sophisticated diagnostic devices—as well as a high level of confidence and trust in the quality of ED services compared with primary care [1–4, 6–8]. German studies support these findings and add that less urgent patients often use the ED because they do not know alternative primary care emergency options [9–12]. Additionally, in urban areas, patients often consider EDs a convenient alternative to a regular primary care provider: they are attracted by the comprehensiveness and quality of diagnostics and treatments provided in EDs, which they rate highly in comparison to available primary care [9–11]. Some cross-sectional data analyses further underline the importance of convenience and proximity to the ED as causes of ED utilization [13–15]. A British study [16] recently suggested in this context that EDs with distinct primary care services in comparison to those not visibly integrated into the ED seemed to increase patient demand for primary care services since they were visible, known and enabled direct access.

A recent scoping review by Nummedal et al. 2025 identified, summarized, and categorized the large number of non-ED-based interventions designed to reduce unnecessary visits to EDs [17]. Few high-quality systematic reviews have addressed how certain interventions at an ED- or non-ED level might impact the utilization of EDs [18, 19]. Only 1 of these reviews analyzed a broader spectrum of non-ED interventions to reduce ED utilization [19]. Against the background of these studies and due to the current reform discussions in Germany, the aim of this systematic review was to provide up-to-date and high-quality evidence to answer the question of how interventions in primary care outside hospitals or in hospital EDs impact emergency care utilization in the ED or in primary care – especially by less urgent patients who self-refer to the EDs.

To address this aim, we hypothesized the following:

- The better availability or accessibility of primary care services may reduce the utilization of EDs by less urgent patients.
- The availability and range of primary care services offered at or next to the hospital/ED setting may increase the utilization of care in these settings.

Methods

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guidelines [20] (see the PRISMA checklist in additional file 1). It was registered with the International Prospective Register of Systematic Reviews (PROSPERO) under protocol number CRD42023493308 in November 2023.

Study eligibility criteria

Studies were eligible if they met our pre-specified PICOS (Patients, Interventions, Comparisons, Outcomes and Study Types). We included studies that were conducted in non-institutionalized patients or in sufficiently large

subgroups of patients, who referred themselves or their children/other dependents to either an ED or to a primary care provider in a non-urgent or less urgent emergency according to professional assessment or a validated triage system. We did not include studies limited to institutionalized people, e.g., elderly patients in retirement homes, who were referred to EDs or taken to the ED by ambulance. We also did not include studies that focused on frequent ED users and their ED utilization patterns or studies that focused on optimization of processes within EDs.

Studies reporting interventions in primary care or in an ED/hospital setting that aimed to control patient flows to EDs or to change patients' emergency care utilization patterns were included. Interventions in primary care are understood to focus on the provision of primary care services for emergency patients outside hospitals, e.g., general practitioners or primary care clinics offering out-of-hours services. Interventions in the ED/hospital setting, on the other hand, are understood to focus on the provision of services for emergency patients in EDs, e.g., by offering primary care services at an ED or by changing ED service provision in other ways. Comparison/control groups were supposed to offer service as usual or standard care without intervention. The outcomes of primary interest were the utilization of hospital EDs or primary care in an emergency care situation, as reported by secondary health insurance/hospital/routine databases. Studies with self-reported ED or primary care utilization were not included.

We included randomized controlled trials (RCTs) and non-randomized (quasi-experimental) studies, such as (controlled) pre-post-studies, interrupted time series and cohort studies with an intervention and a comparison group. We focused on RCTs and quasi-experimental designs because these designs seemed best suited to analyze the causal relationships between a health care intervention and the outcome of interest, namely ED or primary care utilization in an emergency. Cross-sectional data analyses, modelling studies, case–control studies or designs of lower evidence quality were not included. Studies had to be written in German or English and published after 2010. We limited the publication date to focus on the latest evidence. We only included studies conducted (1) in similarly well-developed healthcare systems as the German system and (2) in settings, where publicly or privately insured patients had the option to self-refer to emergency care in EDs or in primary care at no extra cost. Finally, studies had to be available as full texts. There was no eligibility restriction regarding study follow-up.

Systematic searches

The following databases were systematically searched from 2010 to the present to retrieve relevant publications: MEDLINE (via PubMed), the Cochrane Library, and Epistemonikos. The searches were last conducted on April 30, 2025, using relevant subject headings and controlled vocabulary terms (see search strategy for MEDLINE in additional file 2). In addition, we searched the references and cited-by-hits of the included studies. We also conducted a reference- and cited-by-search for relevant systematic reviews that matched our PICOS.

Study selection

The titles and abstracts of all identified studies and systematic reviews were screened by 2 independent reviewers (AR and MD). The full texts were screened by one reviewer, and the inclusion criteria were checked by the second reviewer. Disagreements on study inclusion were resolved through discussion between reviewers (AR and MD).

Study quality and GRADE assessment

The risk of bias of each study was assessed with the Cochrane Risk-of-Bias Tool for RCTs and with the Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool for non-randomized studies [21, 22]. The risk of bias in RCTs was categorized as low, unclear or high. The risk of bias in non-randomized studies was categorized as low, moderate, serious or critical [22, 23].

We further conducted a GRADE appraisal (Grading of Recommendations, Assessment, Development and Evaluation appraisal of the evidence quality considerations [24]) of the studies by interventions on the basis of risk of bias, consistency and imprecision of results, as well as indirectness (transferability of results to other settings) and publication bias. Based on the GRADE classification, we categorized the certainty of evidence into high, moderate, low or very low according to Morche 2020 [23]. The risk of bias and quality/certainty of evidence were assessed by 2 independent reviewers (AR and MD). Disagreements were resolved through discussion between reviewers (AR and MD).

Data extraction and synthesis

Data on study characteristics and results were extracted into standardized extraction tables. During data extraction, the studies were sorted by type of intervention and assigned to "intervention groups". The following study characteristics were extracted by intervention group: author name/year, country, study design, study funding, follow-up period, population, intervention/comparison/control groups, study setting/size of sample, outcomes and outcome/urgency assessment. The outcomes of

primary interest were the utilization of hospital EDs or primary care in an emergency care situation.

Data were extracted by one researcher and checked by a second researcher (MD and AR).

Data analysis

The study results for each intervention were summarized descriptively. Meta-analyses were planned to be conducted if the studies were sufficiently homogeneous. However, because of high heterogeneity in the reported results, no meta-analyses were conducted. To provide a rough quantification, we reported the range of effect sizes for each intervention group based on the individual study results.

Ethics

This study did not involve human participants; therefore, no ethics approval was required.

Results

Results of systematic searches

The systematic database searches yielded 2927 potentially relevant studies (see Fig. 1). After the removal of duplicates, 2896 publications remained for title and abstract screening, and 56 remained for full-text screening, of which 20 were eligible for inclusion. References and reasons for excluding 36 studies after full-text review are provided in additional file 3. Additional searches of the references and cited-by-hits of relevant systematic reviews and included studies yielded 5 additional articles meeting the inclusion criteria. 23 studies with 25 publications were ultimately included for data extraction (Broekmann 2017/van Gils-van Rooij [25, 26]; Chmiel 2016 [27]; Colliers 2017/Philips 2010 [28, 29]; Ellbrant 2020 [30]; van Veelen 2016 [31]; Wackers 2023 [32]; Dolton 2016 [33]; Hong 2021 [34]; Li 2019 [35]; Lippi-Bruni 2016 [36]; Whittaker 2016 [37]; Allen 2021 [38]; Arain 2015 [39]; Buckley 2010 [40]; Jones 2011 [41]; Moe 2019 [30]; O'Kelly 2010 [42]; Adesara 2011 [43]; Morreel 2019 [44]; Sturm 2014 [45]; Platter 2020 [46]; Thijssen 2013 [47]; Petrou 2019 [48]).

The included studies analyzed different interventions that influenced patients' utilization of EDs or primary care services. As part of the data extraction, we clustered the different study interventions into 6 groups. Groups 1 to 3 include interventions that aim to expand primary care services outside hospitals for less urgent patients in emergency situations and to better educate patients about these services. Groups 4 to 6 include interventions that aim to expand or decrease services at EDs, e.g., by adding primary care services to or next to an ED/hospital setting, or by linking ED utilization to co-payments.

Design and characteristics of the included studies

Table 1 provides a summary of the key study characteristics by intervention group. A detailed description of the characteristics of each study is provided in additional file 4. Of the included 23 studies: 1 study is an RCT; 12 studies are pre-post studies (6 of which are controlled pre-post studies); 5 are interrupted time series studies (1 of which is controlled) and 5 are cohort studies. All studies had a comparison group, e.g., service as usual in a comparison region or service before the intervention, while some studies had an additional control group running parallel.

Most studies were conducted in European countries (23–30, 33, 34, 36, 40, 42, 44–47) and in a mixed population of adults and children. 4 studies were exclusively conducted in a pediatric setting [35, 45, 46, 49]. Studies were mostly conducted in national health insurance or tax-financed health systems like the German one (European countries, Canada, Australia), as well as the USA and Cyprus. All studies were conducted in settings where publicly or privately insured patients had the option to self-refer to emergency care in EDs or in primary care at no extra cost. However, in some studies patient co-payments (Buckley 2010 [40] O'Kelly 2010 [42], Petrou 2019 [48]) or financial incentives to health care providers (Hong 2021 [34], Li 2019 [35]) were part of the intervention (see Additional file 4, Study characteristics). All studies analyze the impact of an intervention on ED utilization, and some also quantify the impact on primary (acute) care utilization. While some studies exclusively provide insight into ED utilization by less urgent patients, others also deliver numbers for all patients or for patients with higher urgency. The urgency of patients' conditions in most studies was defined either on the basis of health care professionals' assessment or via emergency assessment algorithms (e.g., the New York University Emergency Department Visit Algorithm [50]) and validated triage scales (e.g., the Manchester [51]/Netherlands [52]/Australian [53] Triage Scale or the Canadian Triage and Acuity Scale [54]) (see additional file 4). The studies use a wide range of statistical analyses to answer their research questions (various forms of regression with/without adjustments, parametric/nonparametric tests) and report results in diverse formats (absolute numbers/numbers per 100/1000 patients or insured years, per week/month/year or coefficients from regression analyses).

For intervention groups 1 and 2 (group 1: Changes in the accessibility/availability of primary care physicians for emergency care, group 2: New/alternative primary care services for emergency care), all 11 studies were natural experiments with interventions in a national, regional or local setting aiming to increase the supply of primary care services for patients – mostly out-of-hours. 8 of the 11 studies were pre-post or interrupted time series studies

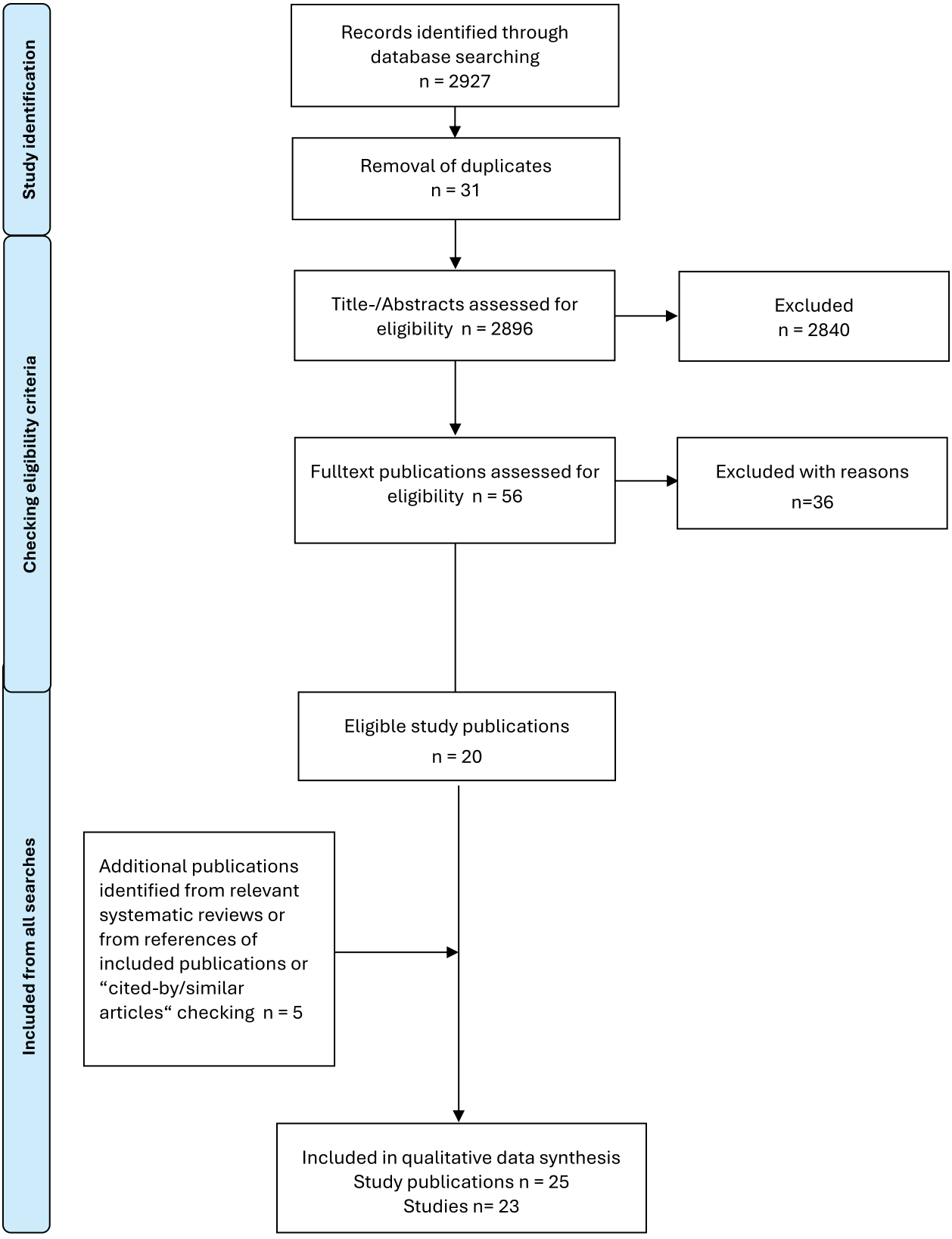

Fig. 1 Study selection flow diagram

Table 1 Study characteristics

Author Name/Year	Country	Study design	Follow-up	Intervention (start, period of intervention)	Outcome assessment/adjustments, subgroup analyses
Intervention group 1: changes in the accessibility/availability of primary care physicians for emergency care					
Dolton 2016	England	controlled pre-post-study	04/2009–02/2014	7day opening of GP practices (2013/2014)	difference-in-differences analysis/time trends & other confounders
Hong 2021	Canada	interrupted time series	04/2002–03/2006	GP out-of-hours care premium (2003)	regression/time trends & GP, patient characteristics
Li 2019	USA	controlled pre-post-study	2008–2010	GP out-of-hours incentives(2009)	regression/PCP characteristics
Lippi-Bruni 2016	Italy	cohort study	2008–2010	increase GPs office hours (2008)	t'tests of numbers/none
Whittaker 2016	England	controlled pre-post-study	2011–2014	added out-of-hours appointments (2014)	difference-in-differences analysis/propensity score matching
Intervention group 2: new/alternative primary care services for emergency care					
Allen 2021	USA	cohort study	2012–2013	Urgent Care Center (UCC) open	difference-in-differences analysis by urgency/time
Arain 2015	England	controlled interrupted time series	04/2008–03/2010	GP-led walk-in-centre, WIC (2009)	regression/time trends
Buckley 2010	Australia	interrupted time series	01/1998–10/2008	After-hours clinic, AHC (2003)	regression/time trends
Jones 2011	Canada	pre-post-study	01/2005–02/2008	AHC (2006)	Wilcoxon signed-rank test on monthly ED visits/time trends
Moe 2019	Canada	interrupted time series	2005–17	AHC (2005)	chi-square-, Mantel-Haenszel test/none
O'Kelly 2011	Ireland	cohort study	1999–2007	out-of-hours GP service (1998)	regression/none
Intervention group 3: patient education about available emergency care services					
Adesara 2011	USA	controlled pre-post-study USA	04–12/2009	education on out-of-hours services	t-tests to compare proportions/none, subgroup analyses
Morreel 2019	Belgium	pre-post-study	01–08/2017	education on out-of-hours services	chi-square/Mann-Whitney-U-tests/none, subgroup analyses
Sturm 2014	USA	RCT	02–05/2010	education on out-of-hours services	chi-square-, Kruskal-Wallis- und Mann-Whitney-tests
Intervention group 4: addition of primary care services to emergency departments					
Broekmann 2017[1]	Nether-lands	cohort study	2011	GP-UCC at hospital EDs	regression/patient & health problem characteristics
Chmiel 2016	Switzer-land	pre-post-study	08/2007–06/2011	GP integrated in hospital (2009)	differences in proportions, diverse tests/none
Colliers 2017[2]	Belgium	controlled pre-post-study	2006/7 2011/12	GP between two EDs/next to ED	regression by age group/none, subgroup analyses
Ellbrant 2020	Sweden	pre-post-study	2012 -15	GP at hospital (2014)	Mann-Whitney U, Fisher's exact test/none
Veelen 2016	Nether-lands	pre-post-study	2012/13	GP next to ED (2013)	chi-square-, Mann-Whitney-U-test/none
Wackers 2023	Nether-lands	cohort study	01–12/2017	After-hours primary care at hospital	regression/age, sex, comorbidities
Intervention group 5: introduction of common access points for emergency ED/primary care at hospitals					
Platter 2020	Nether-lands	pre-post-study	2014–16	Emergency Care Access Point at hospital (2015)	chi-square-& Mann-Whitney-tests/none
Thijssen 2013	Netherlands	(controlled) pre-post-study	2006–12	Emergency Care Access Point at hospital (2008)	logistic segmented regression analysis/age and gender
Intervention group 6: co-payments for emergency room attendance					
Petrou 2019	Nether-lands	interrupted time series	2011–14	Copayments for ED utilization (2013)	regression/none

AHC: After-hours Clinic, ED: emergency department, GP: general practitioner/general practice, PCP: primary care physician, RCT: randomized controlled trial, UCC: Urgent Care Center 1: The study Broekmann 2017 encompasses 2 publications (Broekmann 2017 and van Gils van Rooij 2015) 2: The study Colliers 2017 encompasses 2 publications (Colliers 2017 and Philips 2010)

(Dolton 2016, Hong 2021, Li 2019, Whittaker 2016, Arain 2015, Buckley 2010, Jones 2011, Moe 2019), of which 4 had an additional control group (Dolton 2016, Li 2019, Whittaker 2016, Arain 2015). 7 of the pre-post/time series studies conducted their analyses with some form of time trend adjustment (Dolton 2016, Hong 2021, Whittaker 2016, Allen 2021, Arain 2015, Buckley 2010, Jones 2011). 4 of them adjusted for or assessed additional/other confounders in their analyses (Dolton 2016, Hong2021, Li 2019, Whittaker 2016). In intervention group 3 (patient education about available emergency care services), 1 of the 2 included non-RCT studies had a control group, and both studies performed subgroup analyses. The studies in groups 4 and 5 (group 4: Addition of primary care services to emergency departments, group 5: Introduction of common access points for emergency ED/primary care at hospitals) involved natural experiments implemented at regional hospitals with an ED. The interventions aimed to expand ED hospital services either by integrating primary care physicians into the ED/hospital setting (group 4) or by introducing a common patient access point from which patients are triaged to either primary or ED care (group 5). Only 1 of the 6 studies for intervention group 4 had an additional control group (Colliers 2017/Philips 2010), all other had only the baseline comparison group. 1 of the 2 studies in intervention group 5 (Thijssen 2013) provides supplementary ED visit data out-of-access point hours that are used as a control group in data interpretation. 3 of the 6 studies in intervention group 4 and 1 of the 2 studies in group 5 took some confounding factors into account (Broekmann 2017/Gils van Rooij 2015, Colliers 2017/Philips 2010, Wackers 2023, Thijssen 2013). For intervention group 6 (co-payments for emergency room attendance), only 1 study (Petrou 2019) that analyzed the effect of introducing a copayment for patients using the ED was included. All the studies in groups 5 and 6 were single-center studies. Interventions were supported mostly by public or health insurance funds or by practitioner co-operatives/networks or hospitals themselves (see additional file 4).

Risk of bias and overall quality of the included studies

The risk of bias of the included studies is depicted in Fig. 2. The only RCT (Sturm 2014) had a high risk of bias, which mainly resulted from a biased randomization procedure. Among the 22 non-randomized studies, 4 had a moderate risk of bias, 10 had a serious risk of bias, and 8 had a critical risk of bias. All non-RCTs had an inherent increased risk of bias due to the lack of randomization. The critical risk of bias in these studies mainly resulted from a lack of control and adjustment for potential confounding factors as well as no attempt to analyze potential bias arising from uncontrolled/adjusted confounding factors in subgroup analyses or sensitivity analyses. While few studies had a moderate risk of bias, the overall quality and certainty of the evidence based on the GRADE criteria was very low for all intervention groups given the serious risk of bias and the potential for publication bias (see Tables 2 and 3, Summary of Findings). The transferability of all studies was considered acceptable.

Study results by intervention group

Summaries of the findings are depicted in Table 2 for intervention groups 1–3 and in Table 3 for intervention groups 4–6. The detailed results for each study and intervention group are provided in additional file 5.

Intervention groups 1 to 3 (Table 2): expansion of primary care services outside hospitals and patient education about such services

The 14 studies in intervention groups 1 to 3 provide consistent evidence for a reduction in ED utilization by providing additional out-of-hours primary care services for emergency patients and increasing patients' knowledge about such emergency care services (Table 2: Summary of Findings for groups 1–3 – Expansion of primary care services outside hospitals and patient education about such services). While estimates show significant decreases in ED utilization ranging between 1 and 35%, especially for less urgent patients (also see additional file 5), the estimates are reported in heterogeneous ways and often with limited or even no adjustment for potential confounding. High-urgency ED utilization, on the other hand, has concurrently remained stable or even increased in those studies that report it (Buckley 2010, Jones 2011, O'Kelly 2011, Sturm 2014). Based on the GRADE classification, the certainty of the evidence for these intervention groups was considered very low owing to the serious risk of bias of most of the included studies and the potential for publication bias.

Despite the consistent impact on emergency department utilization, it remains unclear in almost all studies whether patients who did not use the emergency department used alternative primary care services and which services they used. No study documented the exact patient flows from the emergency department to primary care. However, some studies have shown that after interventions, more patients used added primary care services, e.g., 65% of additional out-of-office-hours appointments with primary care physicians were booked in Whittaker 2016, with an increasing trend over time. Other studies also reported increasing trends in primary care visits (Buckley 2010, Moe 2019, Kelly 2011, Moreel 2019, Sturm 2014), although these increases were significant only in intervention group 3 (Moreel 2019, Sturm 2014).

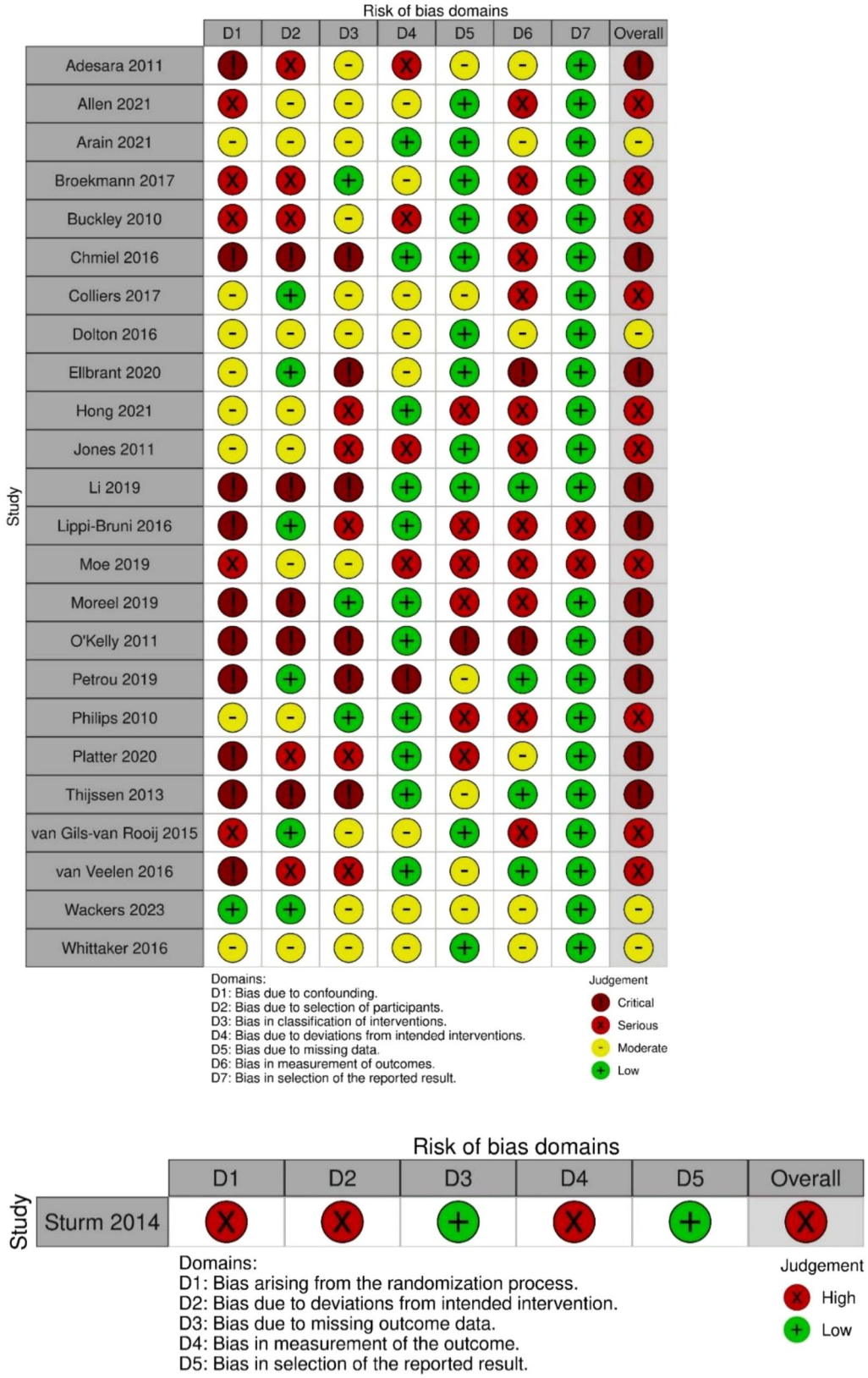

Fig. 2 Risk of bias assessment (part 1: ROBINS-I, part 2: Cochrane tool). 1: the table displaying risk of bias assessment of non-randomized studies includes assessment of 24 publications that describe the results of 22 studies. The publications by Broekmann 2017 and van Gils van Rooij 2015 and by Colliers 2017 and Philips 2010 are parts of the same study, respectively

Table 2 Summary of findings for groups 1–3 – expansion of primary care services outside hospitals and patient education about such services

Author/Year Country	Effect: Utilization of ED	Effect: Utilization of primary care/other care	RoB	Certainty of the evidence (GRADE), Summary of evidence
Changes in the accessibility/availability of primary care physicians for emergency care				
Dolton 2016, England	⇩ (all & moderate urgency, especially on week-ends)	not reported ⇩ (hospitalisations in elderly)	moderate	very low publication bias unclear; consistent but mostly small reductions of ED utilization in 5 studies: between −20 to −25%, mostly low urgency unclear whether patients move to primary care since few data provided
Hong 2021, Canada	⇩ (low urgency)	not reported	serious	
Li 2019, USA	⇩ (all children & subgroups)	not reported	critical	
Lippi Bruni 2016, Italy	⇩ (low urgency visits)	not reported	critical	
Whittaker 2016, England	⇩ (low urgency self-referrers) ⇔ (all urgencies)	trend to use additional appointments	moderate	
New/alternative primary care services for emergency care				
Allen 2021 USA	⇩ (all & no/low urgency)	not reported	serious	very low publication bias unclear; consistent but mostly small reductions of ED utilization in 6 studies: −10 to −35%, mostly low urgency, increased ED utilization in high urgency patients in 2 studies Unclear whether patients move to primary care but some indication for increasing utilization.
Arain 2015 England	⇩ (low urgency, adults only)	not reported	moderate	
Buckley 2010 Australia	⇩ (low urgency) ⇧ (high urgency)	not reported trend for increasing utilization in figures	serious	
Jones 2011 Canada	⇩ (all & medium urgency) ⇔ (high & no urgency)	not reported	serious	
Moe 2019 Canada	⇩ (low urgency)	descriptive only, no clear trend	serious	
O'Kelly 2011 Ireland	⇩ (low urgency, self-referrers) increase in high urgency visits	increasing utilization	critical	
Patient education about available emergency care services				
Adesara 2011 USA	⇩ (low urgency)	not reported	critical	very low publication bias unclear; consistent but small reductions of ED utilization in 3 studies: −1 to −20%; mostly low-urgency, patients seem to move from ED to primary care
Morreel 2019 Belgium	⇩ (voluntary switchers from ED to primary care)	⇧ (voluntary switchers from ED to primary care) ⇧ (workload)	critical	
Sturm 2014 USA	⇩ (low urgency) ⇔ (high urgency)	⇧ (sick-visits) ⇔ (well-visits)	high	

⇩: significant decrease; ⇧: significant increase; ⇔: no significant change

Intervention groups 4 to 6 (Table 3): addition of primary care services to the ED or introducing common access points

The 9 studies in intervention groups 4 to 6 displayed more variable evidence for a reduction in ED utilization when providing additional primary care services in or next to EDs or when linking the utilization of EDs to patient co-payments (Table 3: Summary of Findings, Addition of primary care services to the ED or introducing common access points).

4 of the 6 studies in intervention group 4 reported that the addition of primary care services to hospital EDs may reduce ED utilization by up to 50% (Broekmann 2017, Chmiel 2016, Ellbrant 2020, van Veelen 2016). The triage systems used in these studies support the transfer of patients from the ED to primary care. 2 of the 6 studies reported no effect on ED utilization (Colliers 2017, Wackers 2023). 4 of the 6 studies found a consistent increase in the utilization of primary care services at the hospital (Broekmann 2017, Chmiel 2016, Colliers 2017, van Veelen 2016), and 1 reported an increased demand for services at an integrated care center overall (Chmiel 2016). Between 1 and 10% of patients moving from the ED to primary care return to the ED, as 2 studies have suggested (Chmiel 2016, van Veelen 2016). Similar results as those for intervention group 4 were reported for common access points in intervention group 5 (see Table 3). Up to 20% fewer patients, especially younger and healthier patients (Thijssen 2013), are registered at EDs, and up to 100% fewer patients are self-referred to EDs (Platter 2020, Thijssen 2013). Finally, more patients in centers where primary care was added to the EDs or with common access points for ED or primary care might be admitted to the hospital (Wackers 2023, Thijssen 2013), and fewer might be served via home visits or phone advice (Broekmann 2017, Thijssen 2013). The certainty of the evidence for intervention groups 4 and 5 is considered very low because of the serious risk of bias of

Table 3 Summary of findings for groups 4–6 – addition of primary care services to the ED or introducing common access points

Author/Year Country	Effect: Utilization of ED	Effect: Utilization of primary care/ other care	RoB	Certainty of the evidence (GRADE), Summary of evidence
Addition of primary care services to emergency departments				
Broekmann 2017[1] Netherlands	⇩	⇧ (direct patient contacts) ⇩ (phone advice/home visits)	serious	very low publication bias unclear; 4 of 6 studies show ED reductions: −10 to −50%, 2 studies show no change, 4 of 6 studies show increases in primary care/combined primary/ED care utilization: +20 to +50% Centers with combined ED/primary care services may lead to less phone advice/home visits by GPs (2 studies) and more hospitalizations/less prompt dismissal from ED (1study)
Chmiel 2016 Switzerland	⇩ (low urgency, self-referrers)	⇧ (≤5% back referrals to ED) ⇧ (integrated center, self-referrers)	critical	
Colliers 2017[2] Belgium	⇔	⇧ (GP consultations, especially children)	serious	
Ellbrant 2020Sweden	⇩ (especially low urgency children)	not reported	critical	
van Veelen 2016 Netherlands	⇩ (all) ⇔ (no urgency) ⇧ (high urgency)	⇧ (about half of patients triaged to primary care, about 9% referred back to ED)	serious	
Wackers 2023 Netherlands	⇔	not reported ⇧ (hospital admissions) ⇩ (early dismissals)	moderate	
Introduction of common access points for emergency ED/primary care at hospitals				
Platter 2020 Netherlands	⇩ (especially in ECAP hours) ⇩ (self-referrers)	heterogenious results in different primary care centers ⇧ (ECAP, self-referrers)	critical	very low 2 single-center, very low- quality studies
Thijssen 2013 Netherlands	⇩ (in ECAP hours, less patients 0–49, more elderly/sick) ⇧ (out-of-ECAP) ⇩ (self-referrers)	more direct GP-contacts ⇩ (home visits by GP) ⇧ (hospitalizations from ED)	critical	
Introduction of co-payments for emergency care at hospitals				
Petrou 2019 Cyprus	⇩ (all & low urgency) ⇔ (high urgency)	not reported	critical	very low no conclusions possible

⇩: significant decrease; ⇩: significant increase; ⇔: no significant change 1: Thestudy Broekmann 2017 encompasses 2 publications (Broekmann 2017 and van Gilsvan Rooij 2015) 2: The study Colliers 2017 encompasses 2 publications (Colliers 2017 and Philips 2010)

most of the included studies and the potential for publication bias.

For intervention group 6, the only study examining the effects of co-payments on ED utilization reported significant reductions in all and lower-urgency ED utilization, but not in the highest-urgency patient group. No conclusions can be drawn based on this single-center study for this intervention group.

Discussion

Main findings

Overall, the studies in intervention groups 1 to 3 suggest that the provision of additional primary services out of the hospital – especially out-of-hours – and patient education about these services can draw up to one-third of patients away from EDs. These patients are primarily less urgent cases of illness or injury who self-refer to the EDs. These results support our first hypothesis, which we initially based on cross-sectional and qualitative studies only (see, e.g. [9–11, 13–15]): better accessibility and availability of primary care services may reduce the utilization of EDs. The reported results, however, are based on low-certainty evidence. Also, it remains unclear to what extent the additional primary care services are used by less urgent emergency patients or by others, as these data are not reported. Some studies suggest that the uptake of new primary care services takes time [30, 37, 40, 42, 44, 45]. The patients first need to know about and become familiar with such services. The importance of patient education about available primary care services for emergencies has already been stressed in qualitative studies, where patients reported primarily having used the ED simply because they did not know about alternative care options [9–11]. Good patient education seems crucial in this context.

Primary care services added to EDs at hospitals – as the results for intervention group 4 suggest – may have a ripple effect away from standard care toward more primary care in hospitals but also toward more hospitalizations, as several of the studies suggest [25, 27, 28, 31, 32]. Qualitative and cross-sectional research [9, 13, 16, 55] explains this finding: patients appear to be more likely to use primary care services if these services are as visible and as easily accessible as the EDs are and if they provide comparably comprehensive services (e.g., X-ray, sophisticated diagnostics). These results support our second

hypothesis: the availability and range of care offered at EDs may increase the utilization of EDs.

Moreover, as reported by some of the included studies [25, 28], home visits and telephone consultations may decrease in hospital settings combining primary and ED services, likely because primary care physicians in these settings are taken up by other tasks. This structure might also challenge the allocation of scarce resources since primary care physicians who offer their services in the combined settings are no longer available to staff in- or out-of-hours primary practices or provide home visits.

Alternative interventions such as virtual consultations for less urgent emergency patients could also play a role in the context of this review. We identified several publications investigating these interventions (Potter 2023 [56], Fitzsimon 2023 [57], Lapointe-Shaw 2023 [58]) in the initial search, and 1 of them in the update searches for this paper (Kelly 2024 [59]). These studies, however, did not meet our inclusion criteria (see additional file 3 – Excluded studies with reasons for exclusion). Additionally, 2 of those studies [57, 59] were conducted during the COVID-19 pandemic, which might have biased the results. Any effect observed under COVID-19 conditions regarding a reduction in emergency room utilization could be biased as it is likely associated with the specific situation (avoidance of personal contact was considered a high priority) and not (only) the intervention itself. Such effects might not be sustainable in times after the COVID pandemic. High-quality studies should further investigate such interventions to close evidence gaps.

Comparison with other systematic reviews

Like the present study, the systematic review by Morgan 2013 [19] reported that interventions informing patients about possible care options in emergencies (present intervention group 3) and financial incentives (intervention group 6) may reduce the utilization of EDs. With respect to the intervention "capacity increases in non-ED settings" (intervention groups 1, 2 and 4 in the present study), Morgan 2013 reported variable results: 4 studies reported significant decreases in the utilization of the ED after increases in non-ED capacity, with reductions ranging from 9% to 54%, whereas 5 studies were non-significant, and 1 study found an increase. The reported effect sizes were in the range of our estimates. However, Morgan 2013 included studies published in 2010 or earlier as well as observational study designs of lower evidence quality, which had not been included in the present review. Crawford 2017 [18] reported results similar to ours for the establishment of walk-in centers and general practitioner co-operatives (present intervention group 2), with a significant effect reported for the latter.

Strengths and limitations

A strength is that we included only RCTs or quasi-experimental studies in this review. 1 RCT that fits our PICOS could be included (Sturm 2014 [45]). In addition to the RCT, we included (controlled) pre-post-studies, interrupted time series and other non-randomized studies with intervention and comparison groups – and in some cases with an additional control group – on the basis of the classification provided by Reeves 2017 [60]. In comparison to previous reviews (Morgan, Crawford) [18, 19], we did not include observational studies without a comparison group. Although the inclusion of non-randomized study designs might imply some increased risk of bias, it should be noted that health system interventions – other than drug interventions – render randomization of either patients to interventions or interventions to a specific setting extremely difficult or even impossible. It is reassuring in this context that some of the studies that performed sensitivity analyses to test the robustness of their results found that the effects on ED utilization in most instances were rather under- than overestimated, for example in those studies where spillover of intervention effects from intervention to control regions could not be ruled out [33, 43, 45]. In addition, the primary outcome (ED utilization) was determined using routine health insurance or hospital data in all studies, which likely minimized reporting bias. Studies that assessed ED utilization based on patient self-report were not included (for this reason).

A first limitation is that only German and English papers were included in the review. Another potential limitation of this review is that publication bias was consistently assessed as unclear, as this bias could not be ruled out despite the systematic searches. A statistical evaluation of publication bias could not be carried out since meta-analyses were not conducted.

Another shortcoming of our review may be the somewhat artificial categorization of the studies into intervention groups, which in some cases may mask important differences or similarities between the groups. While the intervention in group 4 is the establishment of primary care services in or near an emergency department, including the triage of patients to either the emergency department or primary care, the intervention in group 5 focuses on the introduction of a joint triage system (Emergency Care Access Point) in an existing combined emergency department/primary care setting. However, the triage of patients to primary care or the ED is likely the major driver of the observed effects on ED/primary care utilization in both groups. The results suggest that triage may strongly reduce or even eliminate the ability of patients to self-refer to an emergency department (see results in Table 3 and in the Results section).

Finally, this study did not examine effects on health-related outcomes, something the included studies also did not report. It is therefore unclear whether the interventions truly directed patients to the "most appropriate" care. 3 of the studies reported that between 1 and 10% of patients who received alternative primary care were referred back to the ED [27, 31, 44]. These individuals might not have been referred to the appropriate care in the first place. Future studies should therefore report such "shift" data between the ED and primary care or health-related outcomes to document whether and what proportion of patients in fact receive care that solves their acute health problem.

Conclusions

While the reported effects on ED or primary care utilization were based on mostly low-quality studies as assessed with the Cochrane Risk-of-Bias Tool for RCTs or the ROBINS-I tool, there was consistent evidence that increasing the availability and accessibility of primary care services and/or better educating patients about these services does reduce non-urgent ED utilization. Primary care services in settings offering combined primary and ED care were more often used by less urgent emergency patients and seemed to induce additional demand. High-quality studies should further explore whether and to what extent the redirection of patient flows is beneficial not only for reducing ED crowding but also for providing the best possible care to patients. Additionally, alternative services such as virtual consultations might also play a role in relieving the burden on existing emergency care services. Further qualified studies are required to investigate into these interventions.

Abbreviations

ED	Emergency Department
GRADE	Grading of Recommendations, Assessment, Development and Evaluation
PICOS	Patients, Interventions, Comparisons, Outcomes and Study Types
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO	International prospective register of systematic reviews
RCT	Randomized Controlled Trial
ROBINS	Risk Of Bias In Nonrandomized Studies of Interventions

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

Supplementary Material 4

Supplementary Material 5

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Author contributions

MD and AR developed the study design, performed the systematic searches, data collection, analyses and data interpretation for this systematic review. SM and DVS provided substantial contributions to the conception of the study. MD and AR drafted the manuscript. All authors have reviewed and approved the submitted version of the manuscript. All authors have agreed to be personally accountable for their own contributions and to ensure the accuracy or integrity of any part of the work, even ones in which they were not personally involved.

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Data availability

All the data generated or analyzed during this study are included in this published article and its supplementary information files (additional files 1–5).

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests. SM and DVS are employed with the German Zentralinstitut für die kassenärztliche Versorgung in Deutschland (Zi). Its research is dedicated to maintaining universal access to ambulatory healthcare under mandatory health insurance.

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